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September 15, 1993

Secretary
Federal Communications Commission
Washington, D. C. 20554

Re: PETITION FOR RULE MAKING BY GENERAL MOTORS RESEARCH CORPORATION - REPLY TO STATEMENTS BY FORD MOTOR COMPANY

Attached is an original and nine copies of our Reply Comments to Ford Motor Company with regard to our Petition for Rule Making, RM-8308.

Should you have any questions or require additional information, please contact the writer at the above address. My telephone and facsimile numbers are also provided for your convenience.

Sincerely,

Lois A. Williams

Lois A. Williams
Vice President

Copies: **Richard Engelman, Chief, Technical Standards Branch**
John Reed, Engineer, Technical Standards Branch
Thomas Stanley, Chief Engineer, Engineering & Tech.

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Let's Get It Together
SAFETY BELTS SAVE LIVES

Before the
Federal Communications Commission
Washington, D. C. 20554

In the matter of:	)	
	)	
Amendment of the Rules to Permit	)	RM-8308
Use of the Band 76-77 GHz for	)	
Vehicle Radar Systems	)	

Responses to Comments of Ford Motor Company

General Motors Research Corporation ("GM") hereby responds below to the key points raised by Ford Motor Company ("Ford") in its comments on the GM petition for use of the band 76-77 GHz for vehicle radar systems.

Ford Position: GM's petition seeks an allocation for one particular system at one particular frequency.

GM is seeking use of 76-77 GHz and has provided the essential characteristics of its system, e.g., FMCW modulation, expected worst-case maximum field strength of 430 mV/m @ 3m, and emissions outside 76-77 GHz attenuated at least 60 dB below the fundamental frequency. GM has not requested approval of its system characteristics. GM expects the FCC to determine maximum allowable field strength and strength of emissions outside the band.

Ford Position: GM Petition fails to include a draft of the rules it proposes the Commission adopt.

As stated above, GM has requested use of 76-77 GHz and has provided essential characteristics of its system. The FCC is best suited to drafting of a new rule and

incorporating such a rule in the overall regulatory scheme. Furthermore, the FCC Chief Engineer is authorized to dismiss or deny petitions which do not warrant consideration.

Ford Position: GM has failed to make a case that allocation of spectrum for vehicle radar serves the public interest.

GM believes that other parties, including the National Highway Transportation Safety Administration, IVHS America, and Ford have made a strong case that allocation of some frequency for vehicle radar is in the public interest. Thus, GM sees no need to separately restate the same case.

Ford Position: The GM petition contains no details on how its radar works.

GM has provided the essential characteristics of its radar that another party would need to determine whether the GM radar will interfere with its planned vehicle radar. Further, the GM radar will not be susceptible to emissions of other radars, including copies of its own (more detail below). Ford has not stated what characteristic of the GM radar is not supplied that is essential to work that Ford may undertake in the 76-77 GHz band.

Ford Position: GM's petition contains only a cursory analysis of the system's interference potential or its ability to withstand interference.

GM has given the frequency band (76-77 GHz), modulation type (FMCW), modulation range (200 MHz), expected worst-case field strength at 3m (430mV/m), and attenuation of emissions outside 76-77 GHz (at least 60 dB below the fundamental frequency). Ford does not state what additional information is needed to assess the "system's interference potential."

As stated in our petition, the GM system uses non-synchronous modulation of approximately 200 MHz. In order for interference to exist, several events would have to occur. First, the interfering radars would have to be operating at precisely the same frequency at a particular instant. Second, the interfering antennas would have to be boresighted on each other because the beam width is very narrow (less than 3 degrees). Third, the interfering transmitters would have to be transmitting at precisely (within less than 100 KHz) the same frequency for longer than a few milliseconds while both vehicles are in forward motion (the radar transmitter is turned off while the vehicle is stopped). The first and third conditions imply that the interfering transmitters are synchronized (which they are not) and which is impossible to achieve without closed loop feedback between the interfering vehicles. The transmitted frequency is being modulated, i.e., swept on a ramp, at the rate of tens of GHz per second. Boresighting of interfering antennas is a very unlikely event while vehicles are in forward motion.

Further, our system does not declare a detection on a single "look." Thus, the interfering antennas would have to remain boresighted and the transmitters synchronized in frequency for more than a few milliseconds, the time it takes for more than one "look." GM believes that only a high-power noise jammer (which is very impractical at these frequencies) would interfere with one of its radars.

Ford Position: The GM petition contains no emission limits.

GM has given its calculated worst-case field strength at 3 meters. The FCC is best suited to determine the appropriate emission limits.

Ford Position: The GM petition implies that GM proposes to use a proprietary technology for its system.

The use of FMCW modulation is well understood in the radar community and is certainly not proprietary technology. GM's specific use of FMCW modulation and the algorithms that determine detection and exclude false targets (clutter and objects not in the path of the host vehicle) are proprietary to GM.

Ford Position: GM does not address compatibility with other systems or the ability to accommodate multiple, open entry. GM's petition does not disclose how, or if, other automobile manufacturers could use 76 GHz spectrum for their radar systems.

GM's radar will not interfere with other systems due to its low electromagnetic field strength and low emission outside the 76-77 GHz band. As stated above, other radars will not interfere with the GM radar. Thus, the operation of GM's radar presents no bar to any other party that would like to use the same spectrum or other spectrums.

Ford Position: GM does not disclose how it proposes the Commission assign licenses in the proposed band or, indeed, whether users would be licensed at all.

GM anticipates that the FCC will not find it necessary to require that each radar owner have a license, as this would be cumbersome and burdensome on consumers and government. Individual licensing may be a disincentive to the use of a promising vehicle safety system. However, this is a matter that the FCC is best suited to determine.

CERTIFICATE OF SERVICE

THE UNDERSIGNED HEREBY CERTIFIES THAT COPIES OF THE FOREGOING REPLY COMMENTS OF GENERAL MOTORS RESEARCH CORPORATION HAVE BEEN MAILED BY UNITED STATES MAIL THIS 15TH DAY OF SEPTEMBER, 1993, TO THE FOLLOWING:

Susan Wing
Christopher P. Gilkerson
Hogan & Hartson
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Washington, D. C. 20004-1109

By Lois A. Williams
Lois A. Williams, Vice President

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THE UNDERSIGNED HEREBY CERTIFIES THAT COPIES OF THE FOREGOING REPLY COMMENTS OF GENERAL MOTORS RESEARCH CORPORATION HAVE BEEN MAILED BY UNITED STATES MAIL THIS 15TH DAY OF SEPTEMBER, 1993, TO THE FOLLOWING:

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By Lois A. Williams
Lois A. Williams, Vice President